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(71) Applicant (*for all designated States except US*): LOCKHEED MARTIN ENERGY SYSTEMS, INC. [US/US]; P.O. Box 2009, Oak Ridge, TN 37831-8243 (US).

(72) Inventor; and
(75) Inventor/Applicant (*for US only*): RAMSEY, J., Michael [US/US]; 733 Hampton Roads Drive, Knoxville, TN 37922 (US).

(74) Agent: SMIRMAN, Preston, H.; Lockheed Martin Energy Systems, Inc., P.O. Box 2009, Oak Ridge, TN 37831-8243 (US).

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(54) Title: APPARATUS AND METHOD FOR PERFORMING MICROFLUIDIC MANIPULATIONS FOR CHEMICAL ANALYSIS AND SYNTHESIS

(57) Abstract

A microchip loboratory system (10) and method provide fluidic manipulations for a variety of applications, including sample injection for microchip chemical separations. The microchip is fabricated using standard photolithographic procedures and chemical wet etching, with the substrate and cover plate joined using direct bonding. Capillary electrophoresis and electrochromatography are performed in channels (26, 28, 30, 32, 34, 36, 38) formed in the substrate. Analytes are loaded into a four-way intersection of channels by electrokinetically pumping the analyte through the intersection (40), followed by a switching of the potentials to force an analyte plug into the separation channel (34).

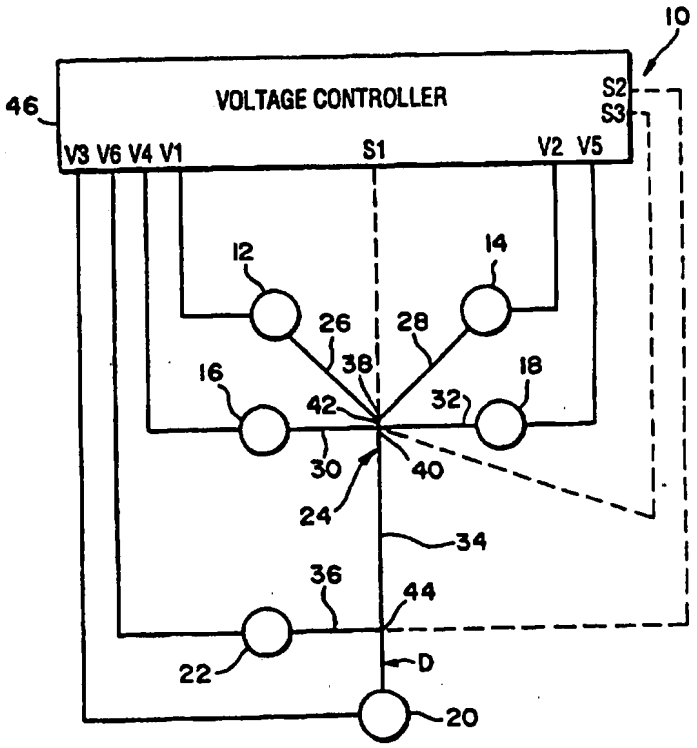

FIG. 1

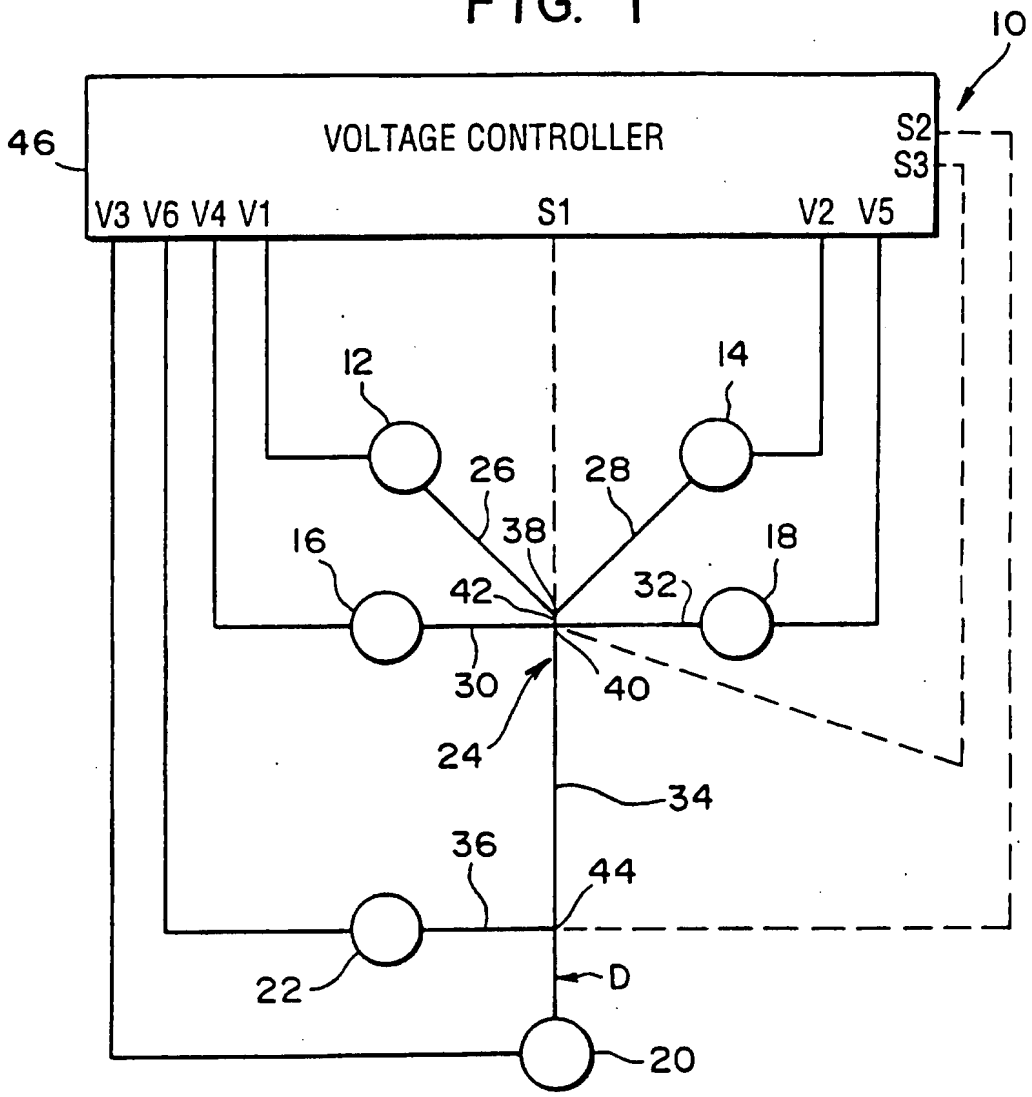
10
46
VOLTAGE CONTROLLER
S2
S3
V3 V6 V4 V1
S1
V2 V5
12
14
26
28
38
16
18
42
32
30
40
24
34
36
44
22
D
20

FIG. 2

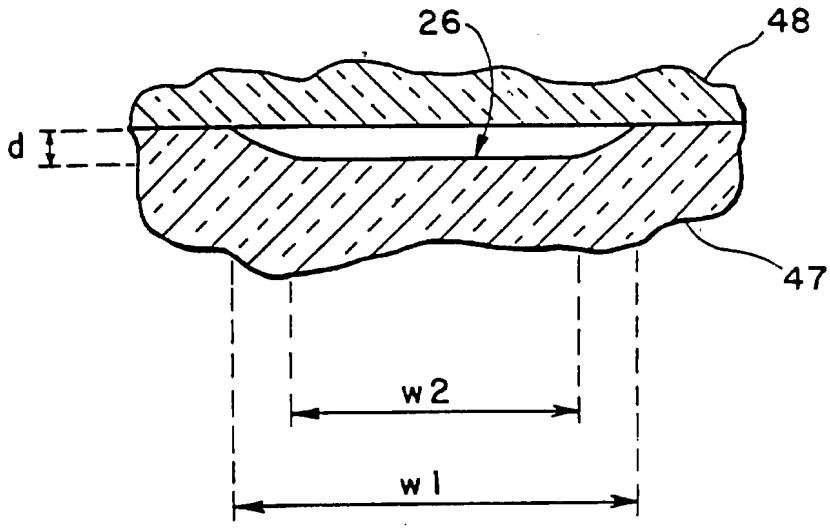
26
48
d
47
w2
w1

FIG. 3

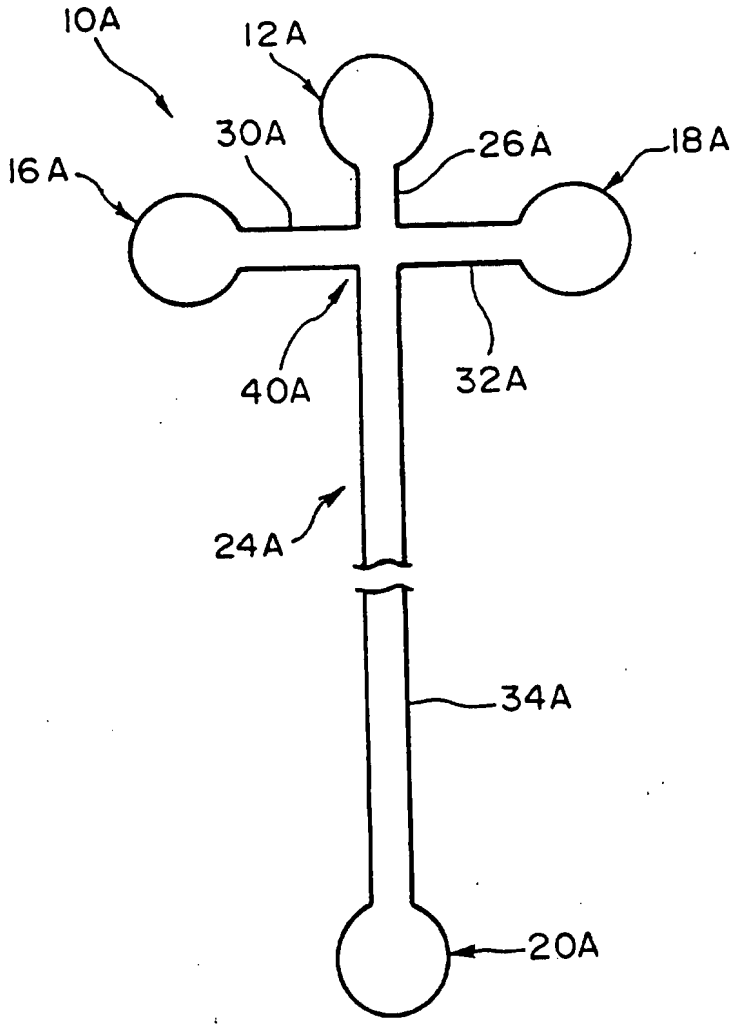

FIG. 4

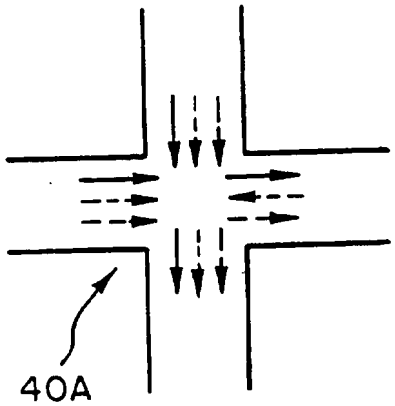

FIG. 5(a) FIG. 5(b) FIG. 5(c)

FIG. 7

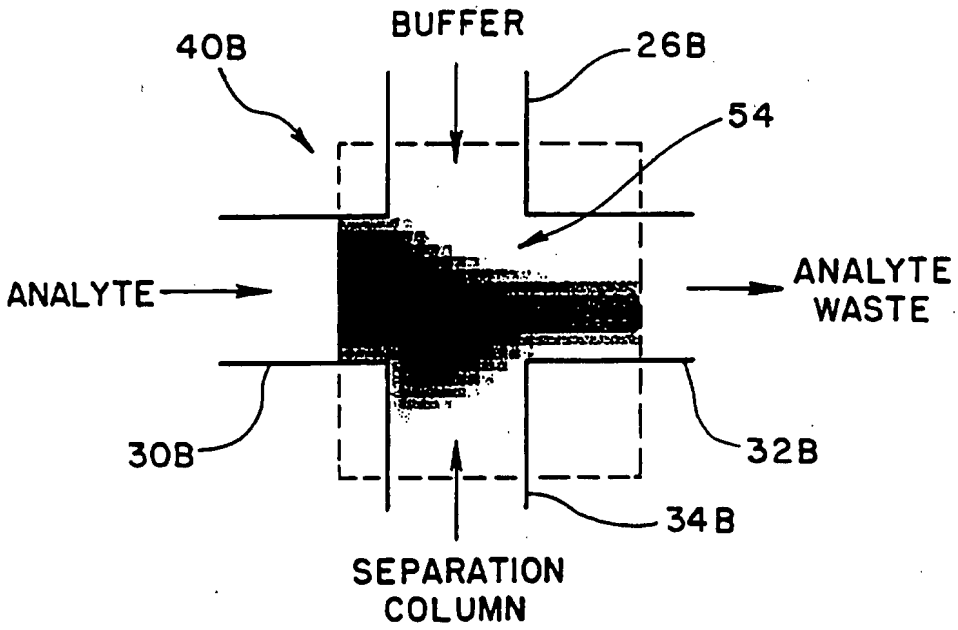

FIG. 6

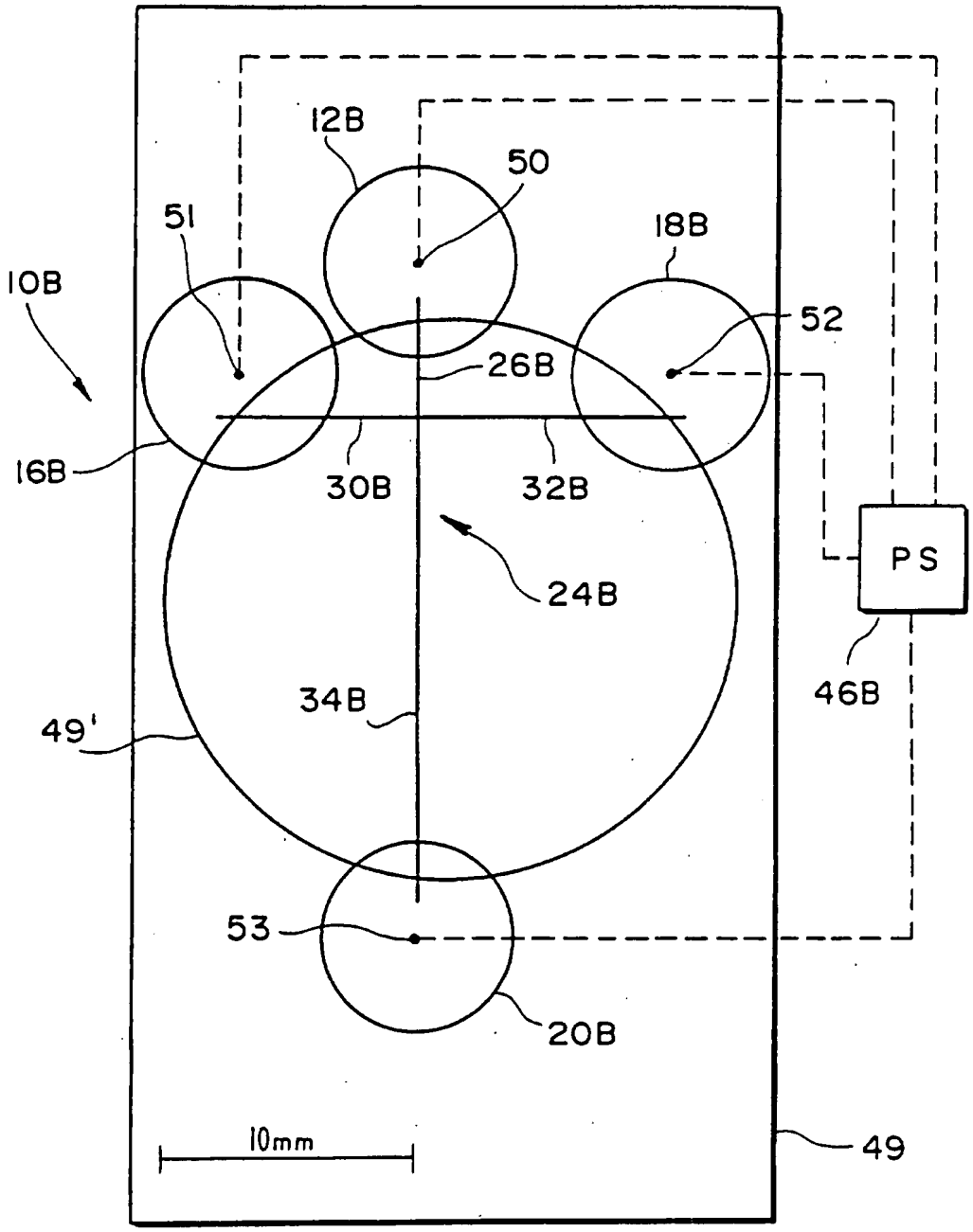
12B
50
51
18B
10B
52
26B
16B
30B
32B
PS
24B
46B
34B
49'
53
20B
10mm
49

FIG. 8(a)

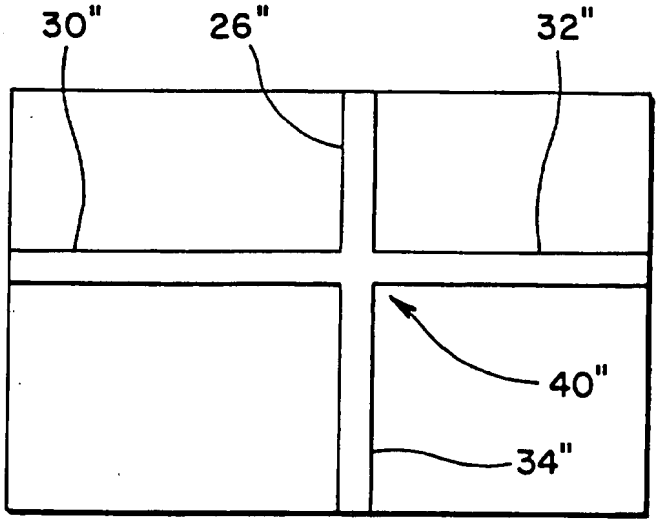

FIG. 8(b)

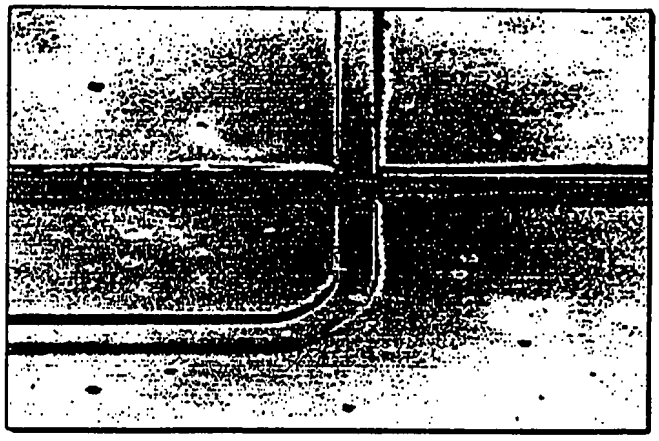

FIG. 8(c)

FIG. 9

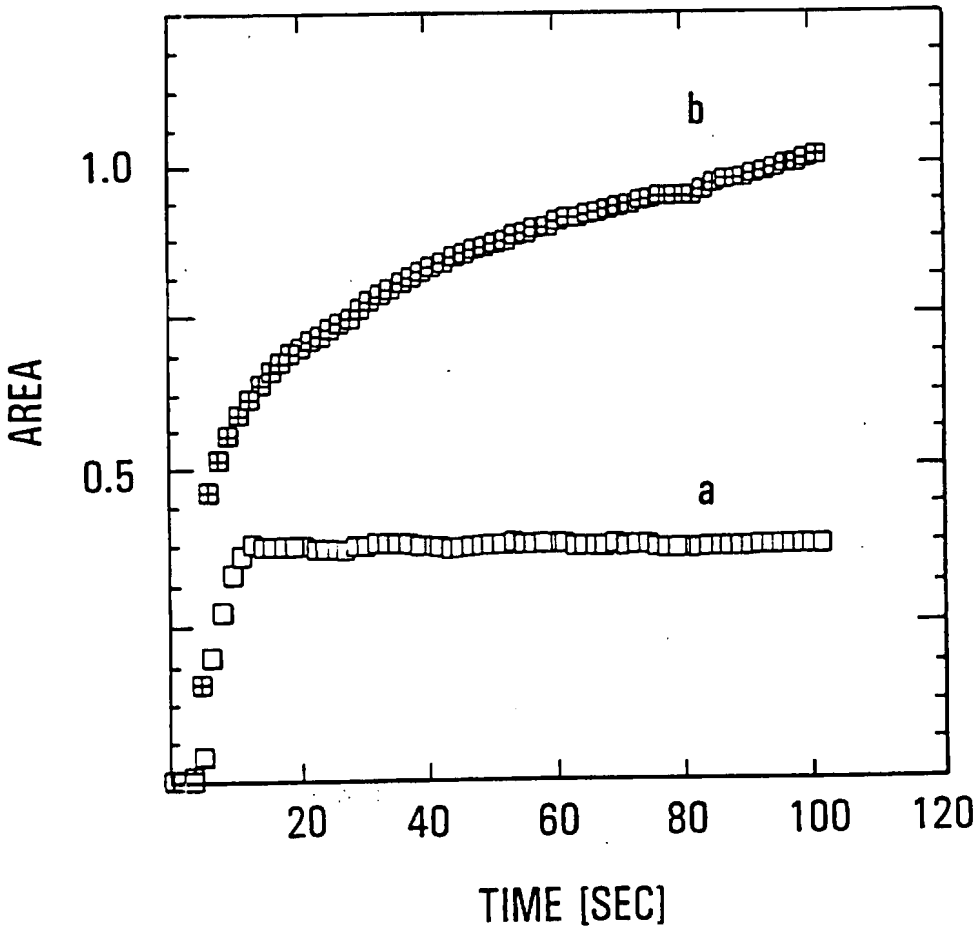

FIG. 10

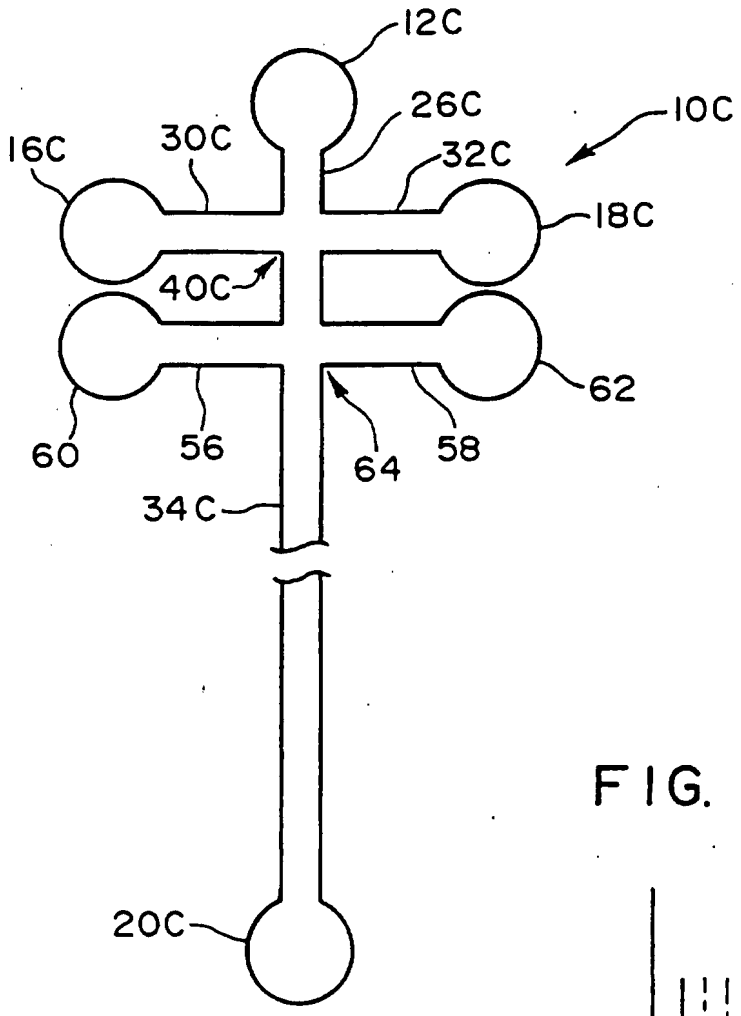

FIG. 11

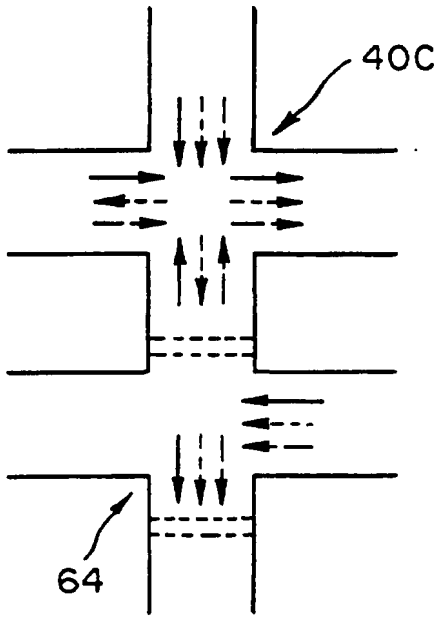

FIG. 12

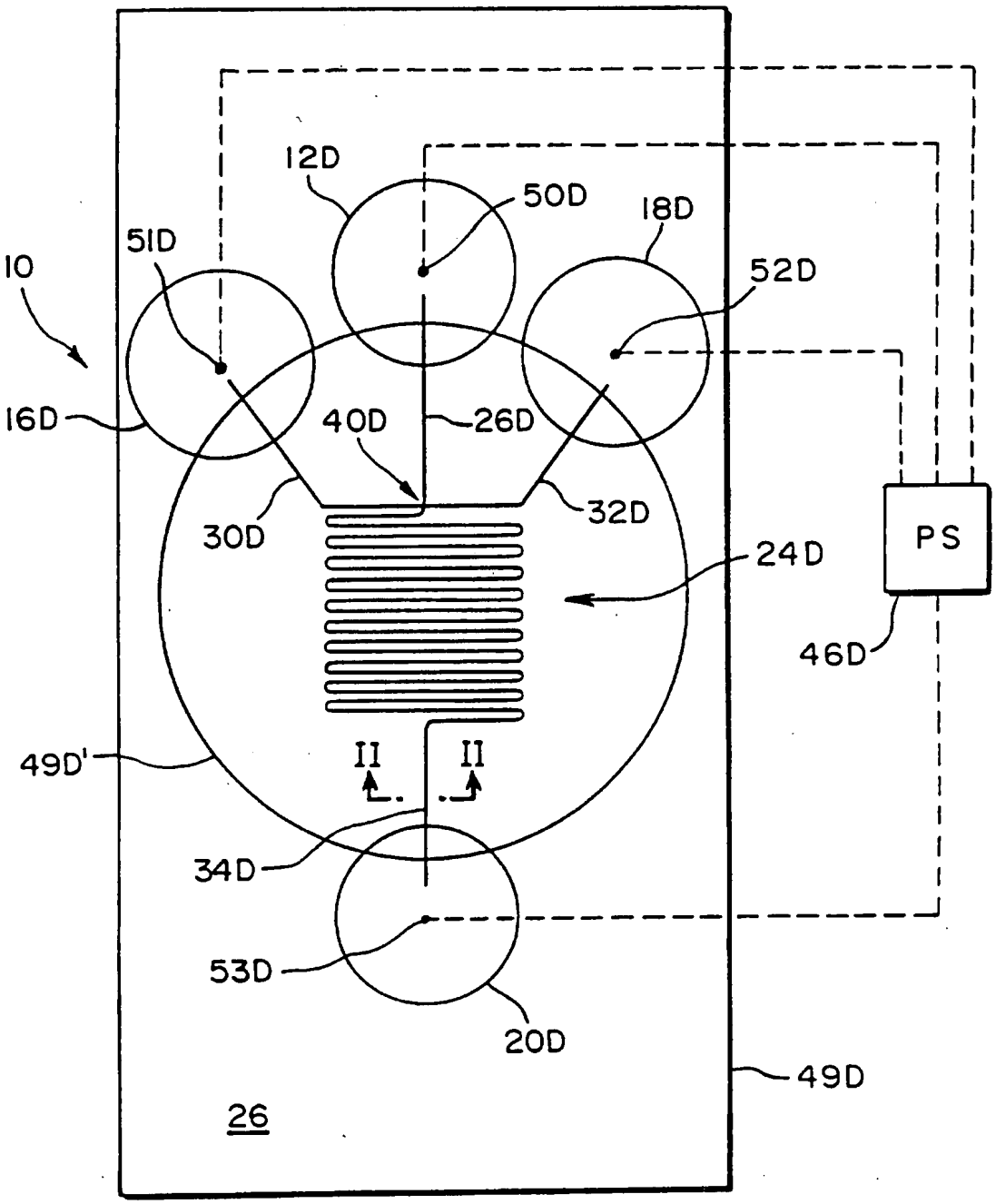
12D
50D
18D
51D
10
52D
16D
40D
26D
30D
32D
24D
PS
46D
49D'
II
II
34D
53D
20D
49D
26

FIG. 13(a)

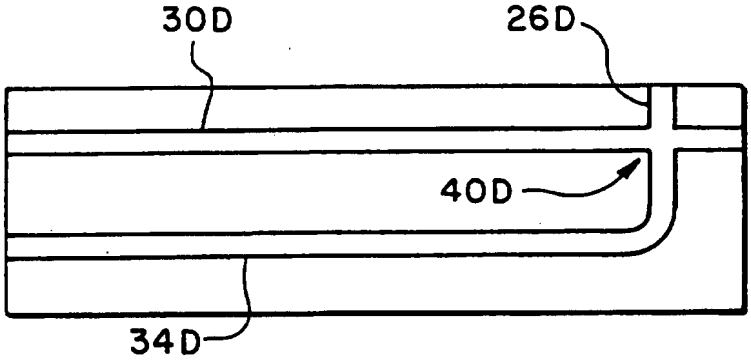

FIG. 13(b)

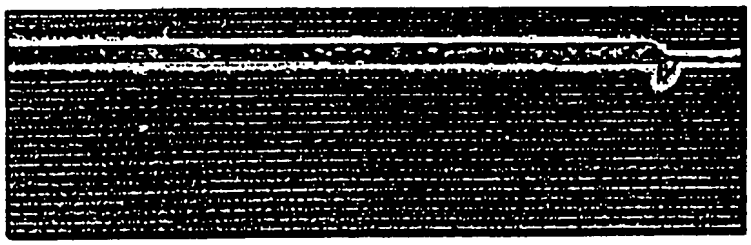

FIG. 13(c)

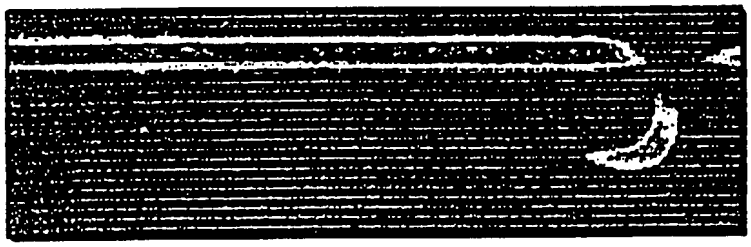

FIG. 13(d)

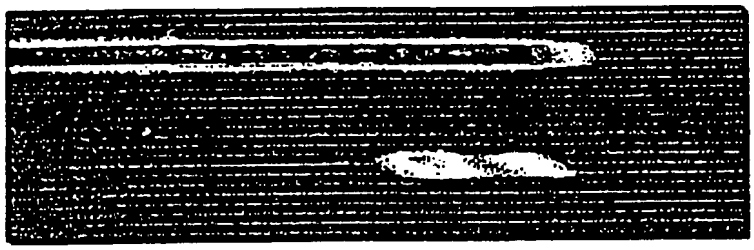

FIG. 13(e)

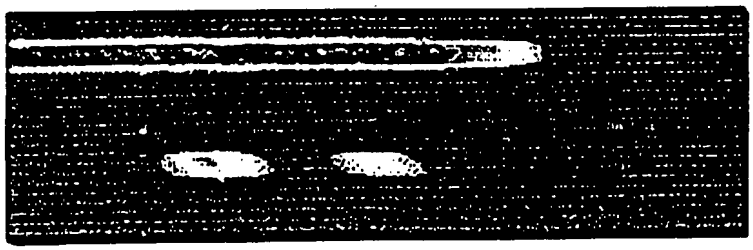

FIG. 14

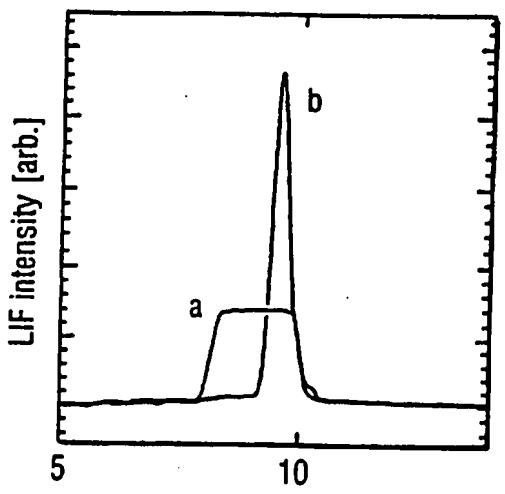

FIG. 15

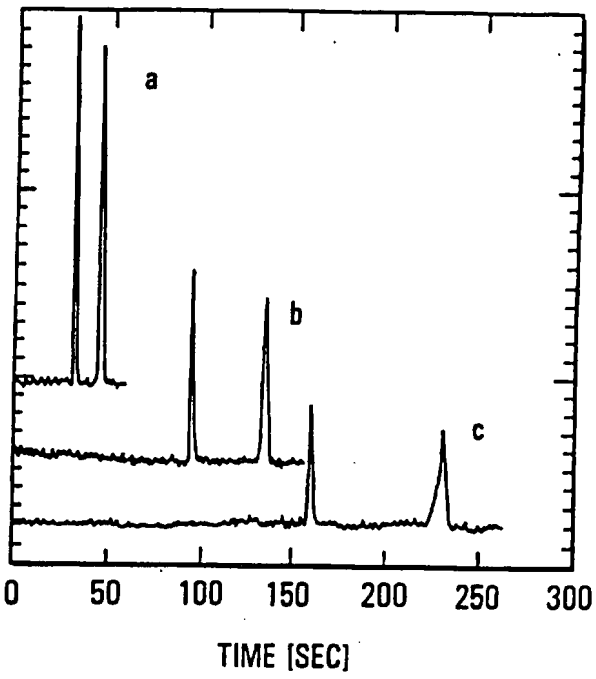

FIG. 16

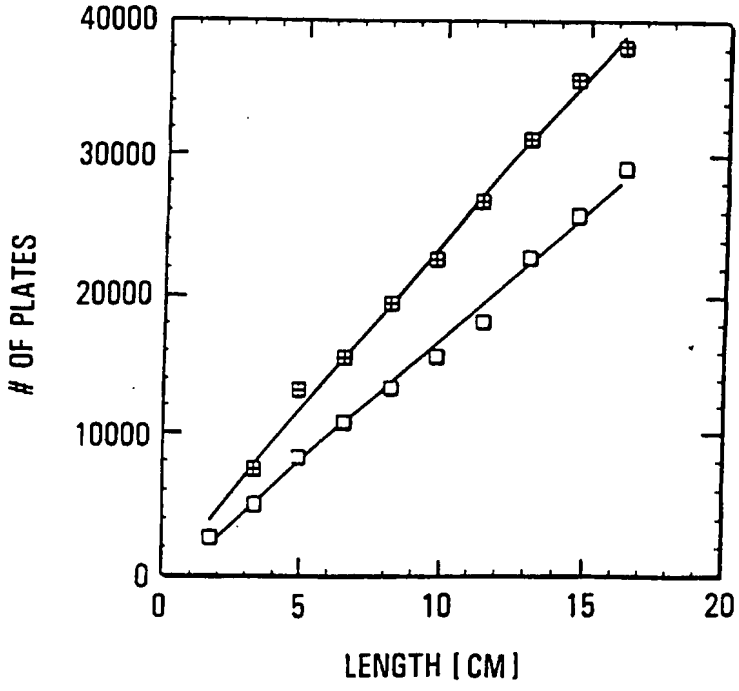

FIG. 17(a)

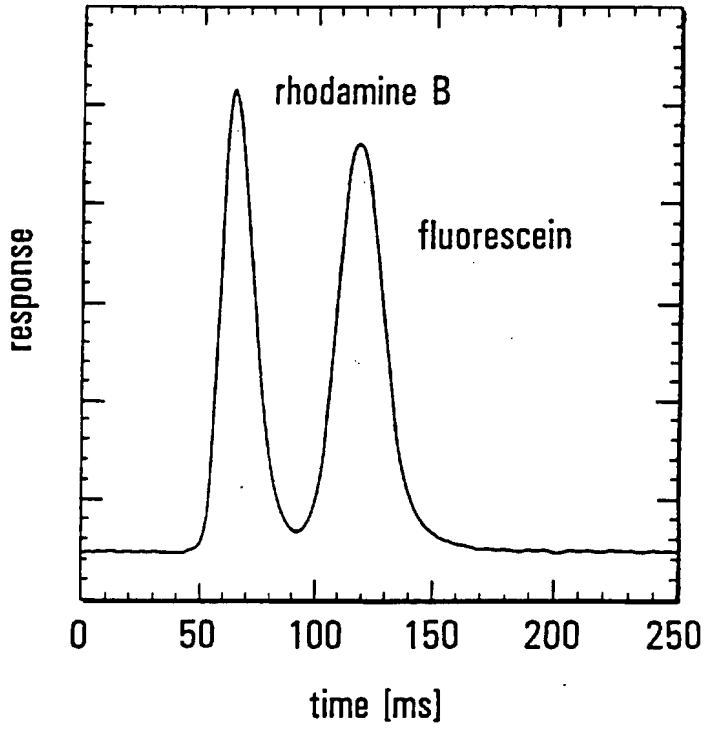

FIG. 17(b)

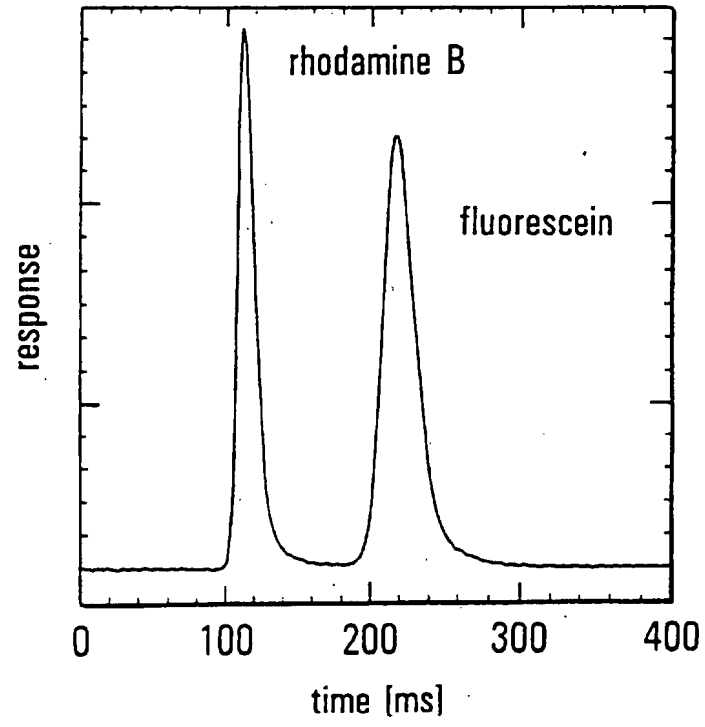

FIG. 17(c)

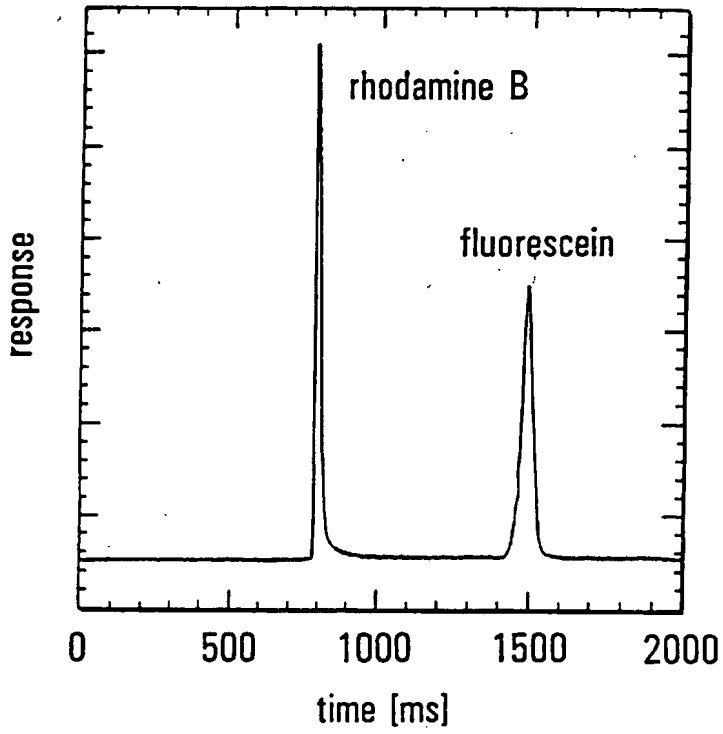

FIG. 18